

CLAIMS

**01)**-An operating method for a packaging machine of the "sleeve" type, which wraps sheets (2) of packaging material around objects (1), in which the said machine comprises:

5     -first object conveyor means (10) for feeding the objects (1) longitudinally in a spaced sequence;

          -second object conveyor means (20), located downstream of and at a short distance from the said first object conveyor means (10), thus forming a first opening (A1) between the said first (10) and the said second (20) object conveyor means, for  
10    receiving the objects arriving from the said first object conveyor means (10) and for transporting the said objects (1) along a wrapping plane which has an entry end and an exit end;

          -third object conveyor means (30), located downstream of and at a short distance from the said second object conveyor means (20), thus forming a second opening (A2)  
15    between the said second (20) and the said third (30) object conveyor means, for receiving the objects (1) arriving from the said second object conveyor means (20);

          -sheet wrapping means (40), located in the proximity of the said second object conveyor means (20), comprising at least one suspended wrapping bar (41), which is orientated transversely with respect to the direction of advance of the objects (1), is  
20    made to move through the said first (A1) and the said second (A2) openings along an orbital path which circumscribes the top of the said second object conveyor means (20), and can transport the sheets (2) of packaging material;

          -sheet conveyor means (50) of the conveyor belt (51) type, positioned underneath and aligned in the proximity of the said first opening (A1), for feeding the sheets (2) of  
25    packaging material into the proximity of the said first opening (A1);

          -synchronizing means (70) for synchronizing the said operating means with each other, characterized in that the sheets (2) of packaging material are fed along the said sheet conveyor (50) of the conveyor belt (51) type in a configuration having an accumulated portion of material (2b; 2b'-2b"; 2bz) and in that the said wrapping bar (41)  
30    picks up the said accumulated portion of material (2b; 2b'-2b"; 2bz) in the proximity of the said first opening (A1) and then carries out the phase of conveying the sheet (2).

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**02)**-Method according to Claim 1, characterized in that the said configuration of the sheet (2) having an accumulated portion of material (2b) is of the undulating type with a single peak.

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**03)**-Method according to Claim 1, characterized in that the said configuration of the sheet (2) having an accumulated portion of material (2b'-2b'') is of the undulating type with two or more peaks.

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**04)**-Method according to Claim 1, characterized in that the said configuration of the sheet (2) having an accumulated portion of material (2bz) is of the gathered type.

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**05)**-Method according to one of the preceding claims, characterized in that a phase relationship is provided between the said sheet conveyor means (50) and the said sheet wrapping means (40) in which, when the initial part of the said accumulated portion of material (2b; 2b'-2b"; 2bz) reaches the proximity of the said first opening (A1), the wrapping bar (41) of the wrapping means (40) passes through the said first aperture (A1) to initiate the phase of conveying the sheet.

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**06)**-Method according to one of the preceding claims, characterized in that the three object conveyor means (10, 20, 30) are driven at constant speed in order to transport the objects (1) with a constant motion from the upstream to the downstream end, and in that the sheet wrapping means (40) and/or the sheet conveyor means (50) are driven at variable speed in order to produce the desired phase relationships for the execution of the wrapping operations.

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**07)**-Method according to one of the preceding claims, characterized in that the said machine additionally comprises sheet feeder means (60), located upstream of the said sheet conveyor means (50), for feeding sheets (2) of packaging material towards and on to the conveyor belt (51) of the sheet conveyor means (50), and in that the accumulated portion of material (2b; 2b'-2b"; 2bz) provided for the sheet (2) is formed on the conveyor belt (51) by using for the said sheet feeder means (60) a feeding speed for the

sheets (2) greater than the conveying speed of the conveyor belt (51) of the sheet conveyor means (50).

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**08)**-Method according to Claim 7, characterized in that the configuration of the sheet (2) having an accumulated portion of material (2b) of the undulating type with a single  
10 peak is produced by means of the following phases:

a)-a first phase in which the speed of feeding the sheet (2) imparted by the sheet feeder means (60) is equal to the transport speed of the belt (51) imparted by the sheet conveyor means (50), thus producing on the conveyor belt (51) a first portion (2a) which is spread out;

15 b)-a second phase in which the transport motion of the conveyor belt (51) of the sheet conveyor means (50) is temporarily stopped, while the motion for feeding the sheet (2) of the sheet feeder means (60) is maintained, thus producing a second, undulating accumulated portion of material (2b), and

c)-a third phase in which the speed of feeding the sheet (2) imparted by the sheet  
20 feeder means (60) is equal to the transport speed of the belt (51) imparted by the sheet conveyor means (50), thus producing on the conveyor belt (51) a third portion (2c) which is spread out.

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**09)**-Method according to Claim 8, characterized in that the configuration of the sheet (2) having an accumulated portion of material (2b'-2b'') of the undulating type with two

or more peaks is produced by executing phases b) and c) one or more times after phase c).

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**10)-Method according to Claim 7, characterized in that the configuration of the sheet (2) having an accumulated portion of material (2b) of the undulating type with a single peak (2b) is produced by means of the following phases:**

- a)-a first phase in which the speed of feeding the sheet (2) imparted by the sheet feeder means (60) is equal to the transport speed of the belt (51) imparted by the sheet conveyor means (50), thus producing on the conveyor belt (51) a first portion (2a) which is spread out;
- 15    b)-a second phase in which the speed of feeding the sheet (2) imparted by the sheet feeder means (60) is greater than the transport speed of the belt (51) imparted by the sheet conveyor means (50), thus producing on the conveyor belt (51) a second, accumulated portion of material (2b) which is undulating with a single peak, and
- 20    c)-a third phase in which the speed of feeding the sheet (2) imparted by the sheet feeder means (60) is equal to the transport speed of the belt (51) imparted by the sheet conveyor means (50), thus producing on the conveyor belt (51) a third portion (2c) which is spread out.

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**11)-Method according to Claim 10, characterized in that the configuration of the sheet (2) having an accumulated portion of material (2b'-2b'') of the undulating type with two**

or more peaks is produced by executing phases b) and c) one or more times after phase c).

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12)-Method according to Claim 7, characterized in that the configuration of the sheet (2) having an accumulated portion (2bz) of material of the gathered type is produced by  
10 means of the following phases:

a)-a first phase in which the speed of feeding the sheet (2) imparted by the sheet feeder means (60) is equal to the transport speed of the belt (51) imparted by the sheet conveyor means (50), thus producing on the conveyor belt (51) a first portion (2a) which is spread out;

15 b)-a second phase in which the speed of feeding the sheet (2) imparted by the sheet feeder means (60) is greater than the transport speed of the belt (51) imparted by the sheet conveyor means (50), thus producing on the conveyor belt (51) a second, accumulated portion of material (2bz) which is gathered.

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13)-Method according to one of Claims 7 to 12, characterized in that the said sheet  
25 feeder means (60) are provided with cutting means (63) and in that the said sheet feeder means (60) initially feed towards the said conveyor belt (51) the front portion of a continuous strip (3) after which the said continuous strip (3) is cut by the said cutting means (63) in order to produce the length of the sheet (2).

5     **14)**-Method according to one of Claims 7 to 13, characterized in that preferably the sheet feeder means (60) are driven with a constant motion and the sheet conveyor means (50) are driven with a variable motion.

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**15)**-Method according to one of Claims 7 to 14, characterized in that the angle ( $\beta$ ) of incidence between the plane in which the sheets (2) are fed and the plane (51) in which  
15 the sheets (2) are conveyed is varied in order to obtain the desired configuration of the accumulated portion (2b; 2b'-2b"; 2bz) of the sheet.

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**16)**-Packaging machine of the "sleeve" type, which wraps sheets (2) of packaging material around objects (1), in which the said machine comprises:

      -first object conveyor means (10) for feeding the objects (1) longitudinally in a spaced  
25 sequence;

      -second object conveyor means (20), located downstream of and at a short distance from the said first object conveyor means (10), thus forming a first opening (A1) between the said first (10) and the said second (20) object conveyor means, for

receiving the objects arriving from the said first object conveyor means (10) and for transporting the said objects (1) along a wrapping plane which has an entry end and an exit end;

5 -third object conveyor means (30), located downstream of and at a short distance from the said second object conveyor means (20), thus forming a second opening (A2) between the said second (20) and the said third (30) object conveyor means, for receiving the objects (1) arriving from the said second object conveyor means (20);

10 -sheet wrapping means (40), located in the proximity of the said second object conveyor means (20), comprising at least one suspended wrapping bar (41), which is orientated transversely with respect to the direction of advance of the objects (1), is made to move through the said first (A1) and the said second (A2) openings along an orbital path which circumscribes the top of the said second object conveyor means (20), and can transport the sheets (2) of packaging material;

15 -sheet conveyor means (50) having a conveyor belt (51), positioned underneath and aligned in the proximity of the said first opening (A1), for feeding the sheets (2) of packaging material into the proximity of the said first opening (A1);

-synchronizing means (70) for synchronizing the said operating means with each other, characterized in that the said first, second and third object conveyor means (10, 20, 30) are driven by a first servo motor (M1) connected to the said synchronizing means (70); in that the said sheet wrapping means (40) are driven by a second servo motor (M2) connected to the said synchronizing means (70); in that the said sheet conveyor means (50) are driven by a third servo motor (M3) connected to the said synchronizing means (70) and transporting towards the said first opening (A1) a sheet (2) of wrapping material having an accumulated portion of material (2b); and in that the  
25 said synchronizing means (70) comprise a programmable control unit (71) which controls the said first (M1), second (M2) and third (M3) servo motors in such a way that the said wrapping bar (41) picks up the said accumulated portion of material (2b; 2b'-2b"; 2bz) in the proximity of the said first opening (A1) and then carries out the phase of conveying the sheet (2).



17)-Packaging machine according to Claim 16, characterized in that preferably the  
5 said conveyor belt (51) of the sheet conveyor means (50) is of the suction type.

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18)-Packaging machine according to one of Claims 16 to 17, characterized in that the  
said machine additionally comprises sheet feeder means (60), located upstream of the  
said sheet conveyor means (50), for feeding sheets of packaging material towards and  
on to the conveyor belt (51) of the sheet conveyor means (50), in that the said sheet  
15 feeder means (60) are driven by a fourth servo motor (M4) connected to the said  
synchronizing means (70); in that the said programmable control unit (71) controls the  
said fourth servo motor (M4); and in that, in order to produce the aforesaid accumulated  
portion of material (2b; 2b'-2b"; 2bz), the said programmable control unit (71) controls  
the speed of the said third servo motor (M3) and of the said fourth servo motor (M4) in  
20 such a way that the transport speed of the conveyor belt (51) of the sheet conveyor  
means (50) is lower than the sheet feeding speed of the sheet feeder means (60).

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19)-Packaging machine according to one of Claims 16 to 18, characterized in that the  
said sheet feeder means (60) additionally comprise cutting means (63) for cutting a  
continuous strip (3) of packaging material in order to produce the sheets (2), in that the

said cutting means (63) are driven by a servo control unit (M5) and in that the said servo control unit is controlled by the synchronizing means 70.

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**20)**-Packaging machine according to one of Claims 16 to 19, characterized in that the said sheet feeder means (60) comprise guides (66, 67) for guiding the strip and sheet  
10 (3/2) in its travel towards the conveyor belt (51).

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**21)**-Packaging machine according to one of Claims 16 to 20, characterized in that the said sheet feeder means (60) are made to oscillate angularly about an axis (68) lying parallel to the plane of transport of the sheets formed by the conveyor belt (51), to make it possible to adjust the angle ( $\beta$ ) of incidence between the plane in which the sheets (2)  
20 are fed and the plane (51) in which the sheets (2) are conveyed.

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**22)**-Packaging machine according to one of Claims 16 to 21, characterized in that an outer casing (60a) is provided to enclose the operating elements (61-62-63-64-65) of the

said sheet feeder means (60) in order to avoid contact between the material forming the accumulated portion (2b; 2b'-2b'') and the said operating elements (61-62-63-64-65).

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**23)**-Wrapping packaging in sleeve form, characterized in that it is produced by the method of one of Claims 1 to 15.

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